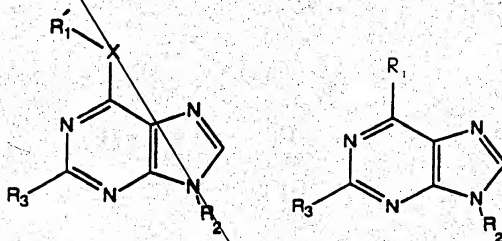


What we claim is:

A 2,6,9-trisubstituted purine composition of matter having the following formula:



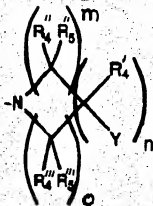
5  $R_1$  is halogen or  $R'_1-X$  wherein X is a amino, ~~oxy~~ thio, or sulfone moiety.

$R'_1$  is a lower alkyl, substituted lower alkyl, cycloalkyl, substituted cycloalkyl, cycloheteroalkyl, substituted cycloheteroalkyl, aryl, substituted aryl, heterocycle, hetaryl, substituted hetaryl, aralkyl, heteroaralkyl, heteroalkyl, alkyl alkenyl, alkyl alkynyl, alkyl cycloalkyl, or alkyl cycloheteroalkyl, each having from 1 to 20 carbon atoms;

10  $R_2$  is hydrogen, or hydrocarbon compound selected from the group lower alkyl, substituted lower alkyl, cycloalkyl, substituted cycloalkyl, aryl, substituted aryl, heterocycle, hetaryl, substituted hetaryl, aralkyl, heteroaralkyl, heteroalkyl, alkyl alkenyl, alkyl alkynyl, alkyl cycloalkyl, or alkyl cycloheteroalkyl wherein each hydrocarbon compound has from 1 to 20 carbon atoms;

15  $R_3$  is halogen, hydroxyl, thio, alkoxy, alkylthio, lower alkyl,  $-NR_4R_5$  or a component having the formula:

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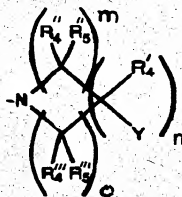


where  $m=1-3$ ,  $n=1-3$ ,  $o=1-3$ ,  $Y$ =carbonyl,  $-NR_4R_5$ , hydroxyl, thiol, alkoxy, alkylthio, and wherein  $R_4$  and  $R_5$  are each independently hydrogen, or a hydrocarbon selected from the group including lower alkyl, substituted lower alkyl, alkoxy, amino, amido, carboxyl, cycloalkyl, substituted cycloalkyl, heterocycle, cycloheteroalkyl, substituted cycloheteroalkyl, acyl, aryl, substituted aryl, aryloxy, hetaryl, substituted hetaryl, aralkyl, heteroaralkyl, alkyl alkenyl, alkyl alkynyl, alkyl cycloalkyl, alkyl cycloheteroalkyl, or cyano, wherein each hydrocarbon has from 1 to 20 carbon atoms wherein when  $Y$  is carbonyl,  $R_4'$  does not exist in the composition,  $R_4''$  and  $R_5''$  may be a single oxygen atom,  $R_4'''$  and  $R_5'''$  may be a single oxygen atom, and wherein when  $R_1$  is 2-hydroxyethylamino and  $R_2$  is methyl,  $R_1'-X$  is not amino, 3-methyl-2-butenylamino, benzylamino, or  $m$ -hydroxybenzyl-amino, when  $R_3$  is 2-hydroxyethylamino, when  $R_2$  is isopropyl,  $R_1'-X$  is not benzylamino,  $m$ -hydroxybenzylamino, or 3-methylbutylamino, when  $R_3$  is 2-hydroxyethylamino and  $R_2$  is 2-hydroxyethyl,  $R_1'-X$  is not benzylamino and when  $R_3$  is selected from the group consisting of 2-propanol-2-methylamino and 2-dimethylaminoethylamino and  $R_2$  is methyl, then  $R_1'-X$  is not benzylamino.

2. The 2,6,9-trisubstituted purine composition of claim 1 wherein  $X$  is amino.

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The 2,6,9-trisubstituted purine composition of claim 1 wherein  $R_1$  is a component having the formula:



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where  $m=1-3$ ,  $n=1-3$ ,  $o=1-3$ ,  $Y=\text{carbonyl}$ ,  $-\text{NR}_4\text{R}_5$ , hydroxyl, thiol, alkoxy, alkylthio, and wherein  $R_4$  and  $R_5$  are each selected from the group including hydrogen, lower alkyl, substituted lower alkyl, alkoxy, amino, amido, carboxyl, cycloalkyl, substituted cycloalkyl, heterocycle, cycloheteroalkyl, substituted cycloheteroalkyl, acyl, aryl, substituted aryl, aryloxy, hetaryl, substituted hetaryl, aralkyl, heteroaralkyl, alkyl alkenyl, alkyl alkynyl, alkyl cycloalkyl, alkyl cycloheteroalkyl, or cyano wherein when  $Y$  is carbonyl,  $R_4'$  does not exist in the composition,  $R_4''$  and  $R_5''$  may be a single oxygen atom,  $R_4'''$  and  $R_5'''$  may be a single oxygen atom.

4. The 2,6,9-trisubstituted purine composition of claim 3 wherein  $R_1'$  is selected from the group consisting of aralkyl and heteroarylalkyl.

5. The 2,6,9-trisubstituted purine composition of claim 4 wherein  $R_1'$  is selected from the group consisting of aralkyl, unsubstituted pyridylalkyl and substituted pyridylalkyl and wherein  $R_2$  is selected from the group consisting of lower alkyl, substituted lower alkyl,

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and alkyl cycloalkyl.

6. The 2,6,9-trisubstituted purine composition of claim 3 wherein  $R_1'$  is selected from the group consisting of aryl, heterocycle, heteroaryl, substituted heteroaryl, and substituted aryl.

7. The 2,6,9-trisubstituted purine composition of claim 3 wherein  $R_1'$  is selected from the group consisting of aryl, unsubstituted pyridyl, substituted pyridyl, and substituted aryl, and  $R_2$  is selected from the group consisting of lower alkyl, substituted lower alkyl, and alkyl cycloalkyl.

8. The 2,6,9-trisubstituted purine composition of claim 2 wherein  $R_3$  is  $-NR_4R_5$  wherein  $R_4$  and  $R_5$  are each selected from the group consisting of hydrogen, lower alkyl, substituted lower alkyl, alkoxy, amino, amide, <sup>B</sup>carboxyl, cycloalkyl, substituted cycloalkyl, heterocycle, cycloheteroalkyl, substituted cycloheteroalkyl, acyl, aryl, substituted aryl, aryloxy, hetaryl, substituted hetaryl, aralkyl, heteroaralkyl, alkyl alkenyl, alkyl alkynyl, alkyl cycloalkyl, alkyl cycloheteroalkyl, or cyano.

9. The 2,6,9-trisubstituted purine composition of claim 8 wherein  $R_1'$  is selected from the group consisting of aralkyl, substituted pyridylalkyl, and unsubstituted pyridylalkyl,  $R_2$  is selected from the group consisting of lower alkyl, substituted lower alkyl, cycloalkyl, and substituted cycloalkyl,  $R_4$  is a substituted lower alkyl having from 2 to 6 carbon atoms, and  $R_5$  is selected from the group consisting of hydrogen, lower alkyl, substituted lower alkyl, aryl, substituted aryl, cycloalkyl, aryl cycloalkyl, heterocycle, substituted heterocycle, heteroaryl, substituted heteroaryl, heteroalkyl, heteroaralkyl, and substituted cycloalkyl.

10. The 2,6,9-trisubstituted purine composition of claim 8 wherein  $R_1'$  is selected from the group consisting of aryl, substituted aryl, pyridyl, and substituted pyridyl,  $R_2$  is

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selected from the group consisting of lower alkyl, substituted lower alkyl, cycloalkyl, alkyl cycloalkyl, and substituted cycloalkyl,  $R_4$  is a substituted lower alkyl having from 2 to 6 carbon atoms, and  $R_5$  is selected from the group consisting of hydrogen, lower alkyl, substituted lower alkyl, aryl, substituted aryl, cycloalkyl, aryl cycloalkyl, heterocycle, substituted heterocycle, heteroaryl, substituted heteroaryl, heteroalkyl, heteroaralkyl, and substituted cycloalkyl.

11. The 2,6,9-trisubstituted purine composition of claim 8 wherein  $R_1$ ' is selected from the group consisting of aralkyl, pyridylalkyl, and substituted pyridylalkyl,  $R_2$  is selected from the group consisting of lower alkyl, substituted lower alkyl, and alkyl cycloalkyl, and  $R_3$  and  $R_5$  are each a substituted lower alkyl having from 2 to 6 carbon atoms.

12. The 2,6,9-trisubstituted purine composition of claim 8 wherein  $R_1$ ' is  $CH_2$  - Aryl or  $CH_2$  - substituted aryl,  $R_2$  is lower alkyl or substituted lower alkyl, and  $R_3$  and  $R_5$  are each  $-CH_2CH_2OH$ ,  $-CHR'CH_2OH$ , or  $-CH_2CHR'OH$  wherein  $R'$  is hydrogen or alkyl having from 1 to 6 carbon atoms.

13. The 2,6,9-trisubstituted purine composition of claim 12 wherein  $R_2$  is isopropyl.

14. The 2,6,9-trisubstituted purine composition of claim 8 wherein  $R_1$ ' is selected from the group consisting of aryl, substituted aryl, pyridyl, and substituted pyridyl,  $R_2$  is selected from the group consisting of lower alkyl, substituted lower alkyl, and alkyl cycloalkyl, and  $R_3$  and  $R_5$  are each a substituted lower alkyl having from 2 to 6 carbon atoms.

15. The 2,6,9-trisubstituted purine composition of claim 8 wherein  $R_1$ ' is aryl or substituted aryl,  $R_2$  is lower alkyl, or substituted lower alkyl, and  $R_3$  and  $R_5$  are each  $CH_2CH_2OH$ ,  $-HR'CH_2OH$ , or  $-CH_2CHR'OH$  wherein  $R'$  is hydrogen or alkyl having from 1

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to 6 carbon atoms.

16. The 2,6,9-trisubstituted purine composition of claim 15 wherein  $R_2$  is isopropyl.

17. The 2,6,9-trisubstituted purine composition of claim 8 wherein  $R_1'$  is benzyl substituted with a halogen, alkoxy, phenyl, pyridyl or nitro group,  $R_2$  is isopropyl, and  $R_4$  and  $R_5$  are each  $-\text{CH}_2\text{CH}_2\text{OH}$ .

18. The 2,6,9-trisubstituted purine composition of claim 8 wherein  $R_1'$  is phenyl substituted with a halogen, alkoxy, phenyl, pyridyl or nitro group,  $R_2$  is isopropyl, and  $R_4$  and  $R_5$  are each  $-\text{CH}_2\text{CH}_2\text{OH}$ .

19. The 2,6,9-trisubstituted purine composition of claim 8 wherein  $R_1'$  is biphenyl,  $R_2$  is isopropyl, and  $R_4$  and  $R_5$  are each  $-\text{CH}_2\text{CH}_2\text{OH}$ .

20. The 2,6,9-trisubstituted purine composition of claim 8 wherein  $R_1'$  is selected from the group consisting of 3-thiomethoxyphenyl, 4-thiomethoxyphenyl, 4-bromophenyl, 4-phenylbenzyl, 4-methoxybenzyl, 4-biphenyl, 3-methoxybenzyl, 4-(2-thienyl)benzyl, 4-(4-methyl)phenylbenzyl, 4-(4-trifluoromethyl)phenylbenzyl, 4-(4-nitrilo)phenylbenzyl, 4-(2-pyridinyl)benzyl, piperonyl, 3-methoxybenzyl, 4-chlorobenzyl, and 4-nitrobenzyl,  $R_2$  is isopropyl, and  $R_4$  and  $R_5$  are both  $\text{CH}_2\text{CH}_2\text{OH}$ .

21. The 2,6,9-trisubstituted purine composition of claim 20 wherein  $R_1'$  is 4-methoxybenzyl.

22. The 2,6,9-trisubstituted purine composition of claim 20 wherein  $R_1'$  is 4-phenylbenzyl.

23. The 2,6,9-trisubstituted purine composition of claim 20 wherein  $R_1$  is 4-methoxybenzyl.

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24. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is 4-biphenyl.
25. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is 3-methoxybenzyl.
- 5 26. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is 4-(2-thienyl)benzyl.
27. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is 4-(4-methyl)phenylbenzyl.
28. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is 4-(4-trifluoromethyl)phenylbenzyl.
- 10 29. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is 4-(4-nitrilo)phenylbenzyl. B
30. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is 4-(2-pyridinyl)benzyl.
- 15 31. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is piperonyl.
32. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is 3-thiomethoxyphenyl.
33. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is 4-thiomethoxyphenyl.
- 20 34. The 2,6,9-trisubstituted purine composition of claim 20 wherein R'<sub>1</sub> is 4-bromophenyl.
35. A cationic salt of the composition of claim 1.

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36. An acid addition salt of the composition of claim 1.
37. A method for inhibiting cell proliferation in mammals comprising administering a therapeutically effective amount of the composition of claim 1 to the mammal.
- 5 38. The method of claim 37 wherein the therapeutically effective amount ranges from about 0.001 to about 100 mg/kg weight of the mammal.
39. The method of claim 37 wherein the composition is administered to a mammal suffering from a cell proliferation disorder selected from the group consisting of rheumatoid arthritis, lupus, type I diabetes, multiple sclerosis, cancer, restenosis, host graft disease, and
- 10 gout. **B**
40. The method of claim 39 wherein the cell proliferation disorder is restenosis.
41. The method of claim 39 wherein the cell proliferation is disorder cancer.
42. The method of claim 39 wherein the cell proliferation disorder is polycystic kidney disease.
- 15 43. The method of claim 39 wherein the mammal is a human.
44. A pharmaceutical composition of matter comprising the composition of claim 1 and one or more pharmaceutical excipients.
45. The pharmaceutical composition of matter of claim 43 wherein the pharmaceutical composition is in the form of a solution.
- 20 46. The pharmaceutical composition of matter of claim 43 wherein the pharmaceutical composition is in the form of a tablet.
47. An antifungal agent useful for treating fungal infections in humans, and animals comprising the composition of claim 1.